PROGRESS REPORTS

FROM

EXPERIMENT STATIONS

SEASON 1958-59

REPUBLIC OF THE SUDAN

PUBLISHED BY
THE EMPIRE COTTON GROWING CORPORATION,
12 CHANTREY HOUSE, ECCLESTON STREET,
LONDON, S.W.1.

1960

COMMONWEALTH MYCOLOGICAL INSTITUTE
5 FEB 1960

E.C.G.C. STAFF LIST

WAD MEDANI, GEZIRA

Plant Breeding	... ...	M. F. Rose, M.A., A.I.C.T.A.
,, ,,	... ...	A. Low, B.Sc.
,, ,,	... ...	R. C. Faulkner, B.Sc.
,, ,,	... ...	N. L. Innes, B.Sc.

SHAMBAT, KHARTOUM

Genetics	... ...	S. O. S. Dark, B.Sc., Ph.D.
,,	... ...	J. H. Saunders, B.Sc.

REPUBLIC OF THE SUDAN

COTTON BREEDING STATIONS

PROGRESS REPORT FOR THE SEASON 1958-59

	Planting Dates	*Picking Dates*
Gezira	Mid August to mid September.	January to March.
Gash	Late August to late September.	Mid January to April.
Tokar	Early September to mid October.	January to May.
Kordofan	Mid June to mid August.	Mid October to February.
Zeidab	First half May.	September to December.
Equatoria	Mid May to August.	October to mid February.

Introductory Note

BY

M. F. ROSE.

The rapid expansion of the cotton crop, both in the Private Estates and Government areas, has posed many problems for research and administration. The importance of crops other than cotton in a policy of diversification has long been stressed and now it appears that cotton itself must face a critical examination regarding its varieties.

For the Sudan, three main considerations have to be borne in mind when formulating a cotton varieties policy for the future: (1) probable surpluses of the standard S and L types, (2) water economy, (3) labour available for hand picking an expanding Egyptian (*barbadense*) crop. It is obvious that if expansion proceeds at its present rate (pre-Roseires dam period) water itself will determine what varieties can be grown: there must be a strong bias towards short period cottons capable of producing a good crop of high quality on 'free' water (water closure, 31st December). Such a regime would automatically preclude standard types. In such an economy only two Sudan types of *barbadense,* Ashmouni and Pima S1, could be accepted, but since Pima S1 falls within the range of Domains Sakel and X1730A (over $1\frac{3}{8}''$) its extensive cultivation would only tend to aggravate present-day surpluses. Although an adequate labour force is now available for hand picking the Egyptian crop, this supply is not unlimited. The growing of American types (even if these were not mechanically picked) would go far to relieve the pressure on labour commitments: with adequate supervision it should be possible to switch labour from the early American to the normal crop (Egyptian).

Experience has shown that most American (*hirsutum*) types will grow as an irrigated crop in the Sudan: the problem has been to find a variety with a yield at least equal that of Domains Sakel and X1730A. The search for very high yielding varieties has been extensive, and over a period of six years only two varieties, Punjab 268F and Acala 4.42, have emerged capable of the necessary yield response. Although

it is generally claimed that the standard spacing of the commercial types (Egyptian) is far too wide for American cotton, no data are yet available to elucidate this point. Bearing in mind the price differential and the importance of the yield × price product, spacing trials are in progress to see how far yields can be boosted by closer intra-row spacing without detriment to lint quality: a similar investigation is being made with the low yielding, high quality Ashmounis.

It would appear from this brief survey that the bias is strongly in favour of American types. However, two serious drawbacks must be stressed: (1) all American types except Wilds Sus 16/1 are highly susceptible to wilt (*Rhizoctonia* spp.) which on occasions has devastated American breeding material at the Gezira Research Station, (2) the introduction of *hirsutum* into the Gezira triangle will impose many administrative problems on the Sudan Gezira Board.

A short period, blackarm resistant Tanguis is being produced which, it is hoped, will meet the trade swing towards a long, coarse cotton of high maturity.

The marked fall in average grade of the standard S and L types from 1946 has exercised the minds of all concerned with the production and marketing of the crop. The appointment of a lint physiologist, working in close co-operation with the cotton breeders, will go far to resolve the many problems which have led to such a deterioration. Already the part played by nitrogen, whitefly and a trend towards a later crop has been deduced from experimental data which go far to absolve genetic deterioration as the major cause of such a decline.

The Kadugli station, serving the rainfed areas of the Sudan, has anticipated changes in trade requirements and the 'soft' cotton BAR 7/8.1 will be replaced by the quality type BAR 11/7 in 1960-61. In this respect a fall in lint per acre must be anticipated but it is probable that the BAR HOP 11 and BAR HOP 7 series will be introduced in the near future. Experimental data have shown these two types to be very heavy yielders whose lint has been acclaimed as excellent by visiting buyers.

In this programme of diversification the rôle of Shambat has not been a passive one. The transfer of blackarm resistance (B_2B_6 or $B_2B_3B_6$) has followed closely on the selection of 'probable' commercial types: the leafcurl problem has not been ignored and work on the transfer of resistance from L cottons and *hirsutum* to desirable Sakel types continues.

Pressure of *ad hoc* problems has swung Shambat away from a full programme of long range research but a detailed genetical study of hairiness in cottons and hairiness transfers is under way; this may well be of great value in the search for hairiness genes independent of or not strongly linked with coarseness of lint. It should be noted,

however, that the whitefly problem has imposed serious limitations on the practical aspect of this work, for whitefly show a marked preference for hairy cottons. The reconciling of these conflicting demands for pest control may well be found in a 'modified' hairiness, capable of warding off medium jassid attack yet at the same time producing a micro-climate less favourable to the build-up of whitefly.

Staff.

Following his appointment as cotton breeder, Mr. N. L. Innes arrived in the Sudan on 2nd August 1958. He was transferred from Wad Medani to Shambat to act as temporary pathologist following the transfer to Nigeria of Dr. M. Dransfield on 23rd January 1959.

Dr. J. E. Jackson, a Government appointee, took over his duties of lint physiologist on 4th October 1958. His main problem will be that of grade, and in this respect he will be working in close co-operation with this Section.

Visitors.

Mr. D. F. Ruston, Secretary of the Empire Cotton Growing Corporation, accompanied by his wife, visited the Sudan from 13th to 19th December 1958. Both Shambat and Wad Medani were inspected and the period included tours of the main Gezira and the Managil Extension, first phase.

To attend the third session of the Sudan Scientific Advisory Committee, Sir Joseph Hutchinson, C.M.G., F.R.S., arrived in the country on 2nd January 1959. He visited both Wad Medani and Shambat, where the many lines of research work were discussed with members of the staff.

THE GEZIRA RESEARCH STATION

BY

M. F. ROSE, A. LOW, R. C. FAULKNER AND N. L. INNES.

Survey of the Season.

In general the season was favourable to the cotton crop and much leeway was made up following the disastrous season of 1957-58. All planting seed, however, was in very short supply. Yields and probably grade would have reached a high level had it not been for the resurgence and persistence of pests (jassid and whitefly) from early November. Their abnormal behaviour was doubtless related to the extremely mild six weeks period from early November and the absence of the north wind, which was barely perceptible by 1st December.

METEOROLOGICAL DATA, G.R.S., 1958-59.

Date	*Mean max.* °F.	*Mean min.* °F.	*Rainfall* mm.	*Humidity* 8 a.m.
April 1958	108 (104)	77 (65)	3·7 (—)	24 (14)
May	107 (101)	77 (75)	25·7 (4·5)	31 (36)
June	101 (104)	77 (79)	40·4 (11·6)	56 (51)
July	93 (98)	72 (74)	212·4 (113·1)	77 (68)
August	91 (92)	72 (72)	115·4 (160·6)	78 (79)
September	97 (98)	72 (72)	42·0 (32·2)	67 (70)
October	102 (102)	71 (73)	— (2·6)	44 (49)
November	100 (100)	68 (72)	— (0·3)	41 (42)
December	95 (106)	62 (62)	— (—)	40 (43)
January 1959	91 (93)	57 (58)	— (—)	34 (42)
February	90 (93)	56 (56)	— (—)	23 (32)
March	100 (104)	63 (64)	— (—)	19 (22)
		Total	439·6 (324·9)	

Figures in brackets are returns for the previous season.
Total rainfall from 1st July to 15th August 1958 = 280 mm.

Rainfall was above average but the pattern of distribution was erratic. Thus very heavy rains fell in July (212 mms.), the fifth highest on record, with the August rainfall (115 mms.) well below the general average. Within this month precipitation was very variable, 41 mms. falling on 3rd August followed by a relatively dry period, with 29·3 mms. falling on 26th. This storm was accompanied by a minor hurricane and many seedlings were buried. September rainfall was below average although good rains fell at the beginning and end of the month. Rainfall recorded from 1st July to 15th August was 280 mms., 29% above the average accepted for yield computation. Taking into account the below-average precipitation of 1957-58, it should be noted that the general circumstances favoured above-average yields.

Apart from the very mild conditions prevailing in November and December, temperatures were normal with the first cold burst on 1st-2nd December. In contrast to past seasons there was no prolonged cold spell, the general mildness being punctuated by sharp spells of short duration. The lowest temperatures recorded (45° F.) were on 22nd January and 18th February with 11th March marking the end of the so-called winter season.

The continuous rains of July precluded cleaning operations on the station and weed growth was heavy. The soil was heavily compacted and in many cases a second re-ridging was necessary. Final tilth was not good, with subsequent poor germination and patchy stands: in consequence, gap-filling was necessary on most experimental areas.

Blackarm was in evidence on all susceptible varieties by 9th September, in many cases causing severe defoliation and stem lesions. The attack on B_2B_3 material was variable (up to grade 8) but types carrying B_6 showed near-immunity. On 18th October leafcurl was noted on S types and three days later 'wilt' made its appearance on the

American crop in the N.E. extension. Most fortunately, this attack was not severe and all trials were carried through to a successful conclusion. Wilt was also recorded on the main station (chiefly on *hirsutum*) but its overall effect on yield was slight.

Flea beetle attack was severe, and early planted cotton (BAR 14/25 on 20th July) suffered considerable damage even after three dustings. Thrips damage was apparent throughout the season. Jassid and whitefly made their appearance in early September (about 3 weeks earlier than in the previous year) and proved to be the two major pests of the season following resurgence and persistence from early November to mid December. The mildness of the season doubtless enhanced the persistence of attack and if a sequence of such conditions is to be expected in future years then a second spray against jassids will have to be seriously considered, with whitefly control still posing the major problem. Pink and spiny bollworm attack in the middle and late crop was average.

The initial development of the crop was slow until the middle of September. From then until the middle of October it showed marked improvement and by the end of the month had all the appearance of a record crop. Such hopes, however, were not realized owing to the late jassid and whitefly attack. One feature of the season was the absence of early senescence and leaf-shed, the crop appearing green and healthy up to the end of January. This did not imply a late season, for on the experimental plots most of the crop was picked by mid February. Boll weights were above average, with Sakel and X1730A returning mean figures of 2·6 and 2·8 gms. respectively.

The G.R.S. Sakel area (49 feddans) and the L area (115 feddans) averaged 4·144 and 6·235 large kantars of seed cotton respectively, with an overall mean of 5·5 large kantars†, 26% above the 1935-44 average of the standard Agricultural Area. The early picks of both types showed marked grade improvement, standing at X2 and X3*: the grading of subsequent picks, however, was disappointingly low at 6-7, with the Sakel and L type means at 5·4 and 4·5 respectively. Jassid and whitefly attack could well have brought about such a serious reduction in the grade level of the later picks while the presence of pink and spiny bollworm in the mid to late crop cannot be ignored. For example, bollworm attack is held directly responsible for a sharp fall in grade, from 1 to X2 for the first pick to 4 for the second pick, on the commercial nuclei at Guneid and Sudeira. There can be little doubt that in the absence of these three major pests the 1958-59 season would have witnessed a return to a normal grade year.

---

†Sakel = 1,246. X1730A = 1,874. Overall = 1,669 lb. seed cotton per acre.
*Quoting grades recorded on the standard variety trials.

Breeding (Egyptian).

(1) B_2B_3 S × L Material.

This material comprised 63 F_4's, 79 F_3's from first backcross, and 47 F_2's from second backcross. The series was duplicated by a parallel set of material from Shambat which had been vigorously rogued against leafcurl susceptibility. Following detailed field studies and laboratory analyses it was possible to make the following broad divisions:— Sakel types—very good, good and equal to control (BAR 14/25); and X1730A types—very good, good and equal to control (X1730A). The scope of this work was made possible by the co-operation of the Sudan Gezira Board graders, to whom grateful acknowledgement is made. Such lots offer most promising material and next year's testing of the six groups (together with spinning test data) should round off what has been a heavy commitment on the resources of the Section. The objectives of this work are to increase the variability of all S and L synthetic types, to produce a B_2B_3 L type of quality equivalent to that of X1730A, to transfer the leafcurl resistance complex from the L to the S genotype, and to transfer a measure of earliness from S to L in an attempt to bring 'grade' back to the pre-1944 level.

(2) Pima S1 × BAR 14/25.

Thirteen families, containing 691 F_2 plants, were selfed, yielding 360 F_3's for detailed study in the coming season. To date it has not been possible to assess the range of variability emerging from the cross: this should be more clearly defined next year. In general all lots were strong and vigorous carrying a very heavy crop of early bolls.

Here again variability will be sought between the F_3 progeny rows with special attention paid to earliness. The transfer of earliness from Pima S1 to BAR 14/25 should go far to raise the grade level.

Testing (Egyptian).

(1) Blackarm Resistant Sakels.

The following types were tested against BAR 14/25 (B_2B_3) control in small scale randomized block experiments: (1) BAR 14/48 $B_2B_3B_6$ Sakel . . . 13 strains (2) BAR 14/49 $B_2B_3B_6$ Sakel: successor type to BAR 14/48 . . . 11 strains (3) BAR 14/38 B_2B_6 Sakel . . . 3 strains.

Yields generally were good and quality little below the Sakel standard. There is little reason to doubt that in the coming season (Breeding Phase) lint quality can be raised to the level of the control.

From the evidence which is accumulating (and this holds for both S and L types) it would appear that B_6 tends to reduce ginning outturn, an effect which appears more marked in the absence of B_3: on the other hand there are indications that the quality of B_2B_6 lint is superior to that of $B_2B_3B_6$. At present, however, these are merely trends which can be confirmed only when more B_2B_6 material is available.

Genotype $B_2B_3B_6$		*lb./acre s/c*	*G.O.T.*	*lb./acre lint*
BAR 14/48	A	1047	28·7	300
	B	1097	28·5	313
	C	1091	28·4	310
	D	1050	28·9	303
	E	1136	28·8	327
	F	1218	28·6	348
	G	1203	28·4	342
	H	1071	28·6	306
	K	1133	27·5	312
	L	1180	28·0	330
	M	1230	29·0	357
	N	1097	30·9	357
	P	1006	29·0	292
BAR 14/25	(C)	1156	29·3	339
S.E. (mean)				21·8 (N.S.)

Plot size = 0·0084 acres

Genotype $B_2B_3B_6$		*lb./acre s/c*	*G.O.T.*	*lb./acre lint*
BAR 14/49	B	1182	29·9	353
	C	1458	29·1	424
	D	1154	30·7	354
	E	1062	28·7	305
	F	1119	27·2	304
	G	1189	29·8	354
	H	1260	29·8	375
	K	1097	29·0	318
	L	1026	27·6	283
	M	807	28·9	233
	N	1260	28·6	360
BAR 14/25	(C)	1154	30·7	354
S.E. (mean)				27·9
L.S.D. (5%)				79

Plot size = 0·0028 acres

Genotype B_2B_6	*lb./acre s/c*	*G.O.T.*	*lb./acre lint*
BAR 14/38	1327	29·7	394
BAR 14/40	1262	29·3	370
BAR 14/41	1327	28·9	383
BAR 14/25 (C)	1423	31·1	442
S.E. (mean)			9·4
L.S.D. (5%)			28
Plot size =	0·0112 acres		

(2) *Blackarm Resistant L types.*

For the third successive season the BAR 4/25 series ($B_2B_3B_6$ L type) was grown under test at the G.R.S. For BAR 4/23 (B_2B_6 type), only the present season's figures are available as this strain was much affected by the very bad season of 1957-58.

The range of yield response for BAR 4/25 (seven strains) is satisfactory and the pattern over the 3 seasons is fairly consistent. Spinning test reports indicate lint characteristics of some strains equal to those of the X1730A control. In such cases the type will appear in the standard variety trials when sufficient seed is available. It will be noted that the yield (lint) of the BAR 5/7 series is, on the average, well down on control and this will be finally discarded. To date the lint quality comparison $B_2B_3B_6$ versus B_2B_6 has not been possible.

Genotype $B_2B_3B_6$		*lb./acre s/c*	*G.O.T.*	*lb./acre lint*
BAR 4/25	A	1174	27·6	324
,,	B	1106	25·9	286
,,	C	1168	26·8	313
,,	D	1351	28·2	381
,,	E	1144	25·8	295
,,	F	1035	26·5	274
,,	G	1248	27·7	346
BAR 5/7	A	944	25·9	244
,,	C	1088	26·0	283
,,	D	973	26·1	254
,,	E	1209	25·6	309
X1730A ($b_2b_3b_6$)		1100	29·5	324
S.E. (mean)				20·8
L.S.D. (5%)				60

Plot size = 0·0084 acres.

Genotype B_2B_6	*lb./acre s/c*	*G.O.T.*	*lb./acre lint*
BAR 4/23	1181	28·1	332
X1730A	1110	31·9	354
S.E. (mean)			5·9 (N.S.)

Plot size = 0·0112 acres.

(*3*) *Karnak* (B_2B_3) *and BLR 14/16* (B_2B_3).

The testing of 20 blackarm resistant strains of Karnak and 16 of BLR 14/16 was a repeat of the previous season, when both trials were a complete failure. In neither case were differences significant but yields from the BLR 14/16 trial were high. It would appear that over the years seed cotton returns from BLR 14/16 are rising although the G.O.T. remains fairly constant around 28-29%. Karnak yields were not spectacular: however, 7 types had been evolved in the B_2B_3 transference which showed strength of main stem and resistance to lodging. Under Gezira conditions all varieties ex-Egypt are notorious for their lodging and it is hoped that similar segregates will be obtained in the Ashmounis following similar gene transfer.

Strain	*S/c lb./acre*	*Lint lb./acre*	*G.O.T.*
Average of 20 Karnak derivatives	1085	322	29·7
Best of 20 Karnak derivatives			
BA 503	1457	420	28·8
BA 499	1254	390	31·1
Karnak Bk (b_2b_3)	756	233	30·8
BAR 14/25 (B_2B_3)	973	286	29·4
Average of BLR 14/16 derivatives	1562	471	30·1
Best of 16 BLR 14/16 derivatives			
BA 388	1835	565	30·8
BA 391	1722	510	29·6
BLR 14/16 (B_2)	1704	498	29·2
BAR 14/25 (B_2B_3)	1569	477	30·4

Miscellaneous Testing.

(1) *Ashmouni Types.*

With a trade swing towards a shorter, coarser type of *barbadense,* special interest has been paid to the four types of Ashmouni first grown under observation in 1956. The original seed supply was small and attention was given first to quality followed by bulking up the material for small scale testing. To assess the economics of any replacement of the standard S and L types, yield response was of primary importance. There was no doubt about quality, Ashmouni 34 being listed as very good, Z10 and A12 as good, and A20 as poor, such figures being consistent over the years. Yield figures from the first trial are given below. It should be noted that the gap in lint returns between BAR XL1 and the three quality Ashmounis is wide, and even in the BAR 14/25 comparison only Z10 has given a higher yield (an increase of 33 lb. of lint, which is not a significant difference).

As an immediate measure for yield increase a closer intra-row spacing might well be adopted* and to this end trials are being laid down in the coming season. Like Karnak, all four varieties are very prone to lodge but it is hoped to remedy this defect by selection in the segregates from the blackarm resistance transfer now in progress at Shambat.

C(55)6 and C(55)47 yielded far better than was expected from previous experience of BP52 material: lint quality was good.

Ashmouni comparisons.

Variety	*S/c lb./acre*	*G.O.T.*	*Lint lb./acre*
A34	970	30·7	298
Z10	1085	34·8	378
A12	855	34·5	295
A20	1463	36·3	531
C(55)6	1363	32·7	446
C(55)47	1224	32·3	395
BAR XL1	1554	33·2	516
BAR 14/25	1186	29·1	345
S.E. (mean)			15·2
L.S.D. (5%)			45

(2) *MSI Trial.*

The introduction of the six Montserrat Sea Island cottons was part of the programme of diversification of *barbadense* types now being followed in the Sudan. Sea Island types introduced in the early 1930's and the crosses from them (the Shambur Sakels) were not popular: they were late, poor yielders with a tendency to run to wood, and bad openers giving immature lint.

*Egypt spacing, 60 × 15-20 cms. Sudan spacing, 80 × 35 cms.

Under the conditions of the present season, all lots gave good germination and sturdy development, being intermediate between the standard S and L types in the production of early flowers. Boll maturation period was slightly longer than that for Sakel: there was a certain amount of 'stickiness' in boll opening but this was not serious. In lint returns the differences between the six lots and the control BAR 14/25 were not significant. In terms of quality one lot, MSI 2, was outstanding: it was longer than BAR 14/25, less wasty and of a whiter colour. In fact MSI 2 now stands at the peak of the quality range for Sudan *barbadense*.

The figures below indicate that if the occasion did arise, the best of these lots could be grown under Gezira conditions with a fair chance of success.

Variety		*S/c. lb./acre*	*G.O.T.*	*Lint lb./acre*
MSI	1	973	30·3	295
	2	1091	29·2	319
	3	920	30·1	277
	4	932	27·2	253
	5	997	29·6	295
	6	985	28·7	283
BAR 14/25		1268	28·4	360
S.E. (mean)				19·9 (N.S.)

Miscellaneous.

Spacing cum Water Stop.

The search for a short to medium staple American type cotton, capable of giving very high yields under the irrigated conditions of the Gezira, has been in progress since 1952. In this respect no cotton* has been able to touch Punjab 268F which in 1956 averaged 2,800 lb. seed cotton per acre over 35 acres. To offset the quality premium on standard types, it was considered that still higher yields from Americans might be obtained by closer intra-row spacing, but on this aspect of yield increase no data were available. In consequence the spacing cum water stop experiment was laid out and sown on 12th August. This included the quality-quantity types BAR 11/7 and P268F (each at 2 spacings) with controls BAR XL1 and BAR 14/25 at the standard spacing of 35 cms. Water stop was made on 31st December (standard practice on 31st March) since in terms of water economy all American types will in future have to live and produce on 'free' water.

The comparison of the two intra-row spacings is disappointing, the closer (25 cms.) giving an average lint increase of only 8·3%.

One point of interest (observational only) arises from the yield figures from BAR XL1 and BAR 14/25 when subject to early water

*Since 1958 Acala 4.42 has made its appearance in the Gezira economy.

stop (31st December): a fall in yield of 25% over the average farm response is noted, a reduction not inconsistent with the Agronomy Section's average figure of 20% from water stop experiments in the Gezira. Average grade of both varieties was improved by half a grade following this early water stop; doubtless this was due to 'enforced earliness' in which a higher percentage of the crop appeared in the early picks.

Treatment	*S/c. lb. acre*	*G.O.T.*	*Lint lb./acre*
P268F (35 cms.)	1436	35·0	503
P268F (25 cms.)	1553	34·2	531
BAR 11/7 (35 cms.)	987	31·2	308
BAR 11/7 (25 cms.)	1077	31·8	342
BAR XL1 (35 cms.)	1336	34·3	458
BAR 14/25 (35 cms.)	967	28·1	272
S.E. (mean)			26·2
L.S.D. (5%)			79

'Old' versus 'New' Seed.

Owing to the disastrous season of 1957-58 it was necessary to repeat this experiment. Fortunately, enough reserve seed was available to plant 6 replications over 2 angias ($\frac{1}{2}$ acre). Spinning test figures from 1957-58 showed no difference in the intra-varietal comparisons but any true differences could easily have been swamped by seasonal effect Picks for each treatment were bulked and each of the 6 replications was graded in seed cotton and lint. In the former case absolute values were given by the grader (who graded blind): in the latter a figure for relative lint rating. It should be noted that in relative rating the difference between 1 and 4 did not amount to more than one full grade.

Grade assessment.

Variety	*Rep. 1*	*Rep. 2*	*Rep. 3*	*Rep. 4*	*Rep. 5*	*Rep. 6*	*Average*
DS (48/49)	6 (3)	6 (1)	7 (1)	7 (1)	5·5 (3)	6 (2)	6·3 (1·8)
DS 1.2.3. (48/49)	7 (1)	6 (2)	7 (3)	6 (2)	7 (1)	6 (3)	6·5 (2)
DS (56/57)	6 (2)	7 (3)	6 (2)	6 (3)	7 (2)	6 (1)	6·3 (2·2)
X1530 (47/48)	5·5 (3)	6 (3)	7 (1)	5·5 (4)	7 (2)	7 (2)	6·3 (2·5)
XA (47/48)	5·5 (2)	6 (4)	6 (2)	6 (2)	6 (1)	7 (1)	6·0 (2)
XA (48/49)	6 (1)	6 (2)	6 (4)	7 (1)	7 (3)	6 (3)	6·3 (2·3)
XA (56/57)	6 (4)	6 (1)	6 (3)	5·5 (3)	6 (4)	7 (4)	6·0 (3·2)

Figures in brackets = relative lint rating.

Absolute grade values (seed cotton) as shown in the above table appear fairly homogeneous and there is nothing to show from 'average grade' that genetic deterioration has taken place since 1947. Although some genetic deterioration may possibly have crept in over the years, other factors (alone or in combination) such as nitrogen, whitefly and trends towards a later crop have doubtless played a far greater part in pulling down average grade. Evidence is now accruing from many different sources that this is in fact the case.

Standard Variety Trials.

The standard variety trials were planted at Turabi (North), Gezira Research Station (Centre) and Hag Abdalla (South) on 12th, 9th and 17th August respectively. Owing to extreme seed shortage, only 10 replications were possible instead of the usual twenty. Effective plot size was 0·0138 acres with spacing standard at 80 × 35 cms.: three plants per hill were left at final thinning.

The most interesting comparisons, Domains Sakel and X1730A with their synthetic blackarm resistant counterparts, were disappointing, and this can reasonably be ascribed to the seed source of the respective varieties. The Gash (Domains Sakel and X1730A) experienced a record season, whereas such multiplication areas as Feragin and Abu Guta, producing the synthetic S types, returned average yields of less than 312 lb. seed cotton per acre. Similarly Guneid (BAR XL1) did not escape the impact of the bad season. All seed weights were down relative to the Gash source.

At all three sites, BAR 14/25.4 outyielded BAR 14/25 although such differences were not significant. At all three sites average yield of the 'Groups' from BAR 14/25.4 were higher than those from BAR 14/25.5, a fact recorded in the previous season.

Blackarm was virtually absent from all trials, with jassid and whitefly (with leafcurl) the major pests. As a conservative estimate the yield of the G.R.S. variety trial was reduced by 1 large kantar (312 lb.) of seed cotton by the resurgence and persistence of these pests from early November.

Relevant data for the season 1958-59 are given in Table 1 with a summary of performance of current strains in Table 2.

The standard variety trial for Northern Province, sited at Kitiab, was planted in mid-May. Growth and development were good up to the green boll stage, when the whole trial was submerged for 3 weeks by the Nile flood. It was estimated that 50% of the crop was lost in the flood waters. Yields, although low, are worth recording here for they run parallel with the Aliab trial of 1957-58: lint assessment again gave preference to Wilds Sus 16/1 and, had it not been for the introduction of Acala 4.42 to Zeidab and Northern Province for 1959-60, Wilds Sus 16/1 would have completely displaced Coker 11 by season 1962-63. Relevant data follow:—

Variety	*S/c. lb./acre*	*G.O.T.*	*Lint lb./acre*
Coker 100	565	34·4	195
Coker 11	378	31·7	120
Wilds Sus 16/1	421	31·6	133
S.E. (mean)			9·0
L.S.D. (5%)			26·7

TABLE 1.

GEZIRA VARIETY TRIALS, 1958-59.

Yield of seed cotton and lint in lb./acre.

Variety	BAR Genes	Turabi (North)			G.R.S. (Centre)			Hag Abdalla (South)			Overall means		
		S/c.	Lint	G.O.T.	S/c.	Lint	G.O.T.	S/c.	Lint	G.O.T.	S/c.	Lint	G.O.T.
Domains Sakel	—	1432	428	29·9	1459	426	29·2	1925	552	28·7	1605	469	29·2
BAR 14/25	B,B,	1321	394	29·8	1346	379	28·2	1548	419	27·1	1405	397	28·3
BAR 14/25.4	,,	1375	408	29·7	1388	400	28·8	1584	436	27·5	1449	415	28·6
,, ,, Gr. 1	,,	1329	415	31·2	1347	408	30·3	1709	506	29·6	1462	443	30·3
,, ,, Gr. 2	,,	1341	401	29·9	1372	398	29·0	1620	455	28·1	1444	418	28·9
,, ,, Gr. 3	,,	1309	395	30·2	1303	375	28·8	—	—	—	—	—	—
BAR 14/25.5 Gr. 1	,,	1293	380	29·4	1347	391	29·0	—	—	—	—	—	—
,, ,, Gr. 2	,,	1321	392	29·7	1321	382	28·9	1576	432	27·4	1406	402	28·6
,, ,, Gr. 3	,,	1309	393	30·0	1268	358	28·2	—	—	—	—	—	—
BLR 14/16	B,	1246	351	28·2	1257	352	28·0	1788	481	26·9	1430	395	27·6
X1730A	—	1285	434	33·8	1551	501	32·3	1945	622	32·0	1594	519	32·6
BAR XL1	B,	1241	416	33·5	1494	488	32·7	1843	592	32·1	1526	499	32·7
Standard error (mean)			14·0			13·9			15·8				
Sign. diff. (P=0·05)			39·3			39·1			44·5				

Table 2.

Summary of performance of current strains in Gezira variety trials up to and including season 1958-59.

Variety	Basic Type	Seed cotton (lb./acre)						Lint (lb./acre)						Location
		No. of trials	Mean			Variety as % of		No. of trials	Mean			Variety as % of		
			Variety	X1730A	DS	X1730A	DS		Variety	X1730A	DS	X1730A	DS	
Domains Sakel	—	20	1271	1301	1271	98	100	20	406	464	406	88	100	Northern Gezira
BAR 14/25	B_2B_3	9	1427	1470	1431	97	99	9	443	522	461	85	96	
BAR 14/25.4	,,	3	1236	1359	1244	91	99	3	366	464	382	79	96	
,, ,, ,, Gr. 1	,,	2	950	1094	1007	87	94	2	300	373	306	80	98	
,, ,, ,, Gr. 2	,,	2	972	1094	1007	89	97	2	295	373	306	79	96	
,, ,, ,, Gr. 3	,,	2	942	1094	1007	86	94	2	288	373	306	77	94	
BAR 14/25.5 Gr. 1	,,	2	916	1094	1007	84	91	2	274	373	306	73	90	
,, ,, ,, Gr. 2	,,	2	931	1094	1007	85	92	2	280	373	306	75	92	
,, ,, ,, Gr. 3	,,	2	932	1094	1007	85	93	2	282	373	306	75	92	
BLR 14/16	B_2	2	902	1094	1007	82	89	2	257	373	306	69	84	
X1730A	—	20	1301	1301	1271	100	102	20	464	464	406	100	114	
BAR XL1	B_1	15	1360	1413	1392	96	98	15	481	502	449	96	107	
Domains Sakel	—	33	1475	1728	1475	85	100	33	467	608	467	77	100	Central Gezira
BAR 14/25	B_2B_3	9	1471	1541	1344	95	109	9	458	544	429	84	107	
BAR 14/25.4	,,	3	1441	1576	1414	91	102	3	437	534	431	82	101	
,, ,, ,, Gr. 1	,,	1	1347	1551	1459	87	92	1	408	501	426	81	96	
,, ,, ,, Gr. 2	,,	1	1372	1551	1459	88	94	1	398	501	426	79	93	
,, ,, ,, Gr. 3	,,	1	1303	1551	1459	84	89	1	375	501	426	75	88	
BAR 14/25.5 Gr. 1	,,	1	1347	1551	1459	87	92	1	391	501	426	78	92	
,, ,, ,, Gr. 2	,,	1	1321	1551	1459	85	91	1	382	501	426	76	87	
,, ,, ,, Gr. 3	,,	1	1268	1551	1459	82	87	1	358	501	426	71	84	
BLR 14/16	B_2	1	1257	1551	1459	81	86	1	352	501	426	70	83	
X1730A	—	33	1728	1728	1475	100	117	33	608	608	467	100	130	
BAR XL1	B_1	17	1618	1538	1298	105	125	17	570	547	415	104	137	
Domains Sakel	—	16	1446	1602	1446	90	100	16	454	560	454	81	100	Southern Gezira
BAR 14/25	B_2B_3	9	1481	1599	1425	93	104	9	444	551	440	81	101	
BAR 14/25.4	,,	3	1848	1972	1861	94	99	3	545	661	558	82	98	
,, ,, ,, Gr. 1	,,	1	1709	1945	1925	88	89	1	506	622	552	81	92	
,, ,, ,, Gr. 2	,,	1	1620	1945	1925	83	84	1	455	622	552	73	82	
BAR 14/25.5 Gr. 2	,,	1	1576	1945	1925	81	82	1	432	622	552	69	78	
BLR 14/16	B_2	1	1788	1945	1925	92	93	1	481	622	552	77	87	
X1730A	—	16	1602	1602	1446	100	111	16	560	560	454	100	123	
BAR XL1	B_1	16	1539	1461	1267	105	121	16	536	508	399	106	134	

American Breeding (A. Low).

Objective.

In the 1958-59 season, two varieties were grown in the Nuba Mountains, BAR 7/8.1 as the commercial crop and BAR 11/7 (Abu Habl) as its ultimate replacement. The former is a high yielder but of low quality, the latter the reverse. The gap between them is 20% in yield and 30% in yarn strength (40's count). The object of the American breeding programme is to close this gap, so as to have high yield and high quality incorporated in one variety.

Hybridisation of these two varieties with suitable local and imported varieties, and also with each other, has been emphasized in preference to continuing direct selection within the two varieties. After direct selection made particularly for quality in BAR 7/8.1, BAR 7/8.2 was obtained which over 4 years of testing in variety trials has shown a 6% increase of yarn strength and 10% increase of yield over the first filter. This, however, does not close the gap in quality. In BAR 11/7, selections were made particularly for yield, and BAR 11/7.1 was obtained as Group 1 and Group 2. These selections require further testing but it is not expected that the 20% increase of yield required will materialise. These two selections are nevertheless valuable improvements.

There are three main lines of approach in an attempt to close the gap completely.

(A) The transference of intrinsic fibre strength from Hopi Acala to BAR 11/7 and BAR 7/8.2.

(B) The transference of yield through boll weight (yet without loss of bolls per plant) from Wilds Sus 16/1 to BAR 11/7.

(C) Selection from the cross between BAR 7/8.2 × BAR 11/7 (direct and reciprocal crossing) the end point being a type which combines the quality of BAR 11/7 with the yield of BAR 7/8.2. In this approach there is no loss of homozygosity in B_2B_3 blackarm resistance as with (A) and (B) above, in which homozygosity will have to be recovered in the course of the programme.

Results.

(A). (i) *BAR 11/7 × Hopi Acala.*—9 strains of this cross were tested in F_4, as the season 1957-58 was very adverse and wilt also caused serious loss of yield and quality in all F_3 comparisons. However, expectations from the results in F_3 were confirmed this season in F_4 material in both yield and quality. Quality is assessed each year by standard laboratory methods of combing, etc., hand stapling by experienced lint examiners of the Sudan Gezira Board, and by spinning

tests of the most promising strains. Some of the lines were shown to be homozygous for B_2B_3 blackarm resistance and further lines will be established in 1959-60.

BAR 11/7 × Hopi Acala—strains in BAR HOP 11.

Testing	*Stelometer*		*1957-58 Lea count × s. 40's*	*1958-59 Hand stapling (strength) 1=H.A. level 3=7/8.2 level*	*Mean of 1957-58 (F_3) and 1958-59 (F_4) Yield % of BAR 11/7*
	F_2	F_3	F_3		
Hopi Acala	24·0	27·9	2118	1	124
BAR 11/7	21·0	23·8	2297	2	100
Strain 2	24·1	—	—	2	130
3	26·9	—	—	1	142
4	26·2	28·9	2454	2	134
5	27·9	27·6	2167	2	130
7	26·0	30·1	2545	1	125
8	23·4	24·8	2234	2	145
9	26·3	30·8	2584	1	116

Note: differences were significant at the 1% level in both 1957-58 and 1958-59.

(A). (ii) *BAR 7/8.2 × Hopi Acala.*—20 strains of this cross were tested in the same manner as (i) above and expectations were also confirmed. The highest yielding strains of this cross outyielded the highest yielding strains of (i) above, the extra yield doubtless coming from the BAR 7/8.2 parent. In this cross, emphasis will be placed on quality. Homozygous B_2B_3 lines are being established.

BAR 7/8.2 × Hopi Acala—strains in BAR HOP 7.

Testing	*Stelometer*		*1957-58 Lea count × s. 40's*	*1958/59 Hand stapling (strength) 1=H.A. level 3=7/8.2 level*	*Mean of 1957-58 (F_3) and 1958-59 (F_4) Yield % of BAR 7/8·2*
	F_2	F_3	F_3		
Hopi Acala	24·0	26·7	2192	1	87
BAR 7/8.2	21·0	23·3	2002	3	100
Strain 1K	28·0	—	—	1	114
2K	25·9	24·7	2217	1	165
5K	23·6	26·1	2260	1	184
2S	25·0	27·6	2679	1	117
4S	23·2	—	—	1	110
8S	23·1	26·3	2211	2	126
11S	24·3	—	—	1	139

Note: differences were significant at the 1% level in both 1957-58 and 1958-59

Preliminary tests at standard variety trial level of multiline strains of (i) and (ii) above will be made at all 5 sites in the Nuba Mountains in 1959-60 under the designation BAR HOP 11 and BAR HOP 7 respectively.

(B). *BAR 11/7 × Wilds Sus 16/1.*—A small variety trial of 6 selected strains has confirmed that the yield potential of Wilds Sus 16/1 has been transferred to the erect, non-lodging plant habit of BAR 11/7. Bifurcation in the programme to obtain two staple lengths, of 37/32″ and 44/32″, has yielded favourable results. Further replicated trials at F_5 level (with hand stapling and spinning tests) will be repeated in the 1959-60 season.

Many of the lines examined are known to be homozygous for B_2B_3 blackarm resistance, and further lines will be established in 1959-60.

Wilds Sus 16/1 × BAR 11/7 F_4.

Testing	*Lint lb./acre*	*% of BAR 11/7*	*G.O.T.*	*Boll wt. (gms.)*
BAR 11/7	192	100	31·9	3·1
Wilds Sus 16/1	232	121	34·9	4·4
Strain 1	231	120	32·8	4·0
2 +	234	122	33·3	3·4
3 +	211	110	32·7	4·3
4	190	100	33·2	4·3
5	256	133	31·5	3·9
6 +	234	122	31·7	3·8
S.E. (mean)	21·1			

+ BAR 11/7 staple length.

(C). *BAR 7/8.2 × BAR 11/7 F_2 (and reciprocal).*—30 single plants have been retained for replicated trials in 1959-60. Selection between and within F_2 families (unreplicated) was made on yield, boll weight, strength of fibre, nep, and lint length (by combing methods). Yield and quality assessment by hand stapling and spinning tests will be made in the F_3 in the coming season. 1,000 F_2 single plants were examined.

Miscellaneous.

(i) *Storm resistance.*—The transference of lint cling from Stormaster to BAR 11/7 was examined in the F_3. Such a transfer would be of importance if machine stripping were ever adopted in the Central Rainlands. Progress in this programme will appear in next season's report when details of the F_4 are known.

(ii) *BAR 11/9 (Successor type to BAR 11/7).*—The gene B_6 for blackarm resistance was transferred to BAR 11/7 (B_2B_3) and 22 strains homozygous for $B_2B_3B_6$ were tested for yield and quality (hand stapling and spinning tests). The transference of B_6 to a uniform BAR 11/7 background has increased the variability and promising strains are now on hand for future testing.

BAR 11/9 ($B_2B_3B_8$) —STRAINS FOR FURTHER TRIAL IN 1959-60.

Treatment	*Lint lb./acre*	% BAR 11/7	*G.O.T.*	*Hand stapling strength*
BAR 11/7	148	100	30·2	2
Strain 2	183	124	30·0	1
,, 4	256	173	30·8	1
,, 5	223	151	27·8	3
,, 8	241	163	32·3	2
,, 10	260	176	30·9	3
,, 11	285	193	33·9	3
,, 12	219	148	32·2	3
,, 18	208	141	32·0	3
,, 21	213	143	29·5	3
S.E. (mean)	17·0			
L.S.D. (5%)	48			

80 × 50 cms. 6 replications. Rand. block. Plot size 0·0014 acre.
1=Better than 11/7. 2=Equal to 11/7. 3=Worse than 11/7.

TANGUIS CROSSES (N. L. Innes).

(1) BAR 14/25 × Tanguis.

The object of this programme, already stated in the 1956-57 Report, is to combine in one distinct type the whiteness, loofiness, high ginning outturn and high boll weight of Tanguis with the earliness and blackarm resistance of BAR 14/25.

Because of the very poor 1957-58 season, selfed seed from each non-replicated row of strains appearing in the Medani yield trial had to be bulked, as single plants did not yield sufficient seed to permit testing for blackarm resistance at Shambat.

Twenty-six selections, consisting of 19 straight F_5's from the original cross, 5 F_4's of the first backcross to BAR 14/25 and 2 F_3's of the second backcross to BAR 14/25, were tested at Shambat for blackarm resistance.

Natural seed of these 26 selections, plus the two parental controls BAR 14/25 and Tanguis, was used to plant a yield trial at Medani, the layout being a balanced incomplete block design with 9 replications of 7 blocks in groups of 4.

Unfortunately, owing to bulking of selfed seed from rows instead of single plants, only four selections proved to be true breeding for blackarm resistance, grading 7-8 and under. Other selections obviously consisted of a mixture with varying proportions of four basic types:—

(a) True breeding for blackarm resistance (homozygous B_2B_3, B_2 or B_3).

(b) True breeding for blackarm susceptibility (homozygous b_2b_3).

(c) Segregating with degrees of resistance (homozygous for one gene and heterozygous for the other).

(d) Segregating susceptible plants (heterozygous for both genes or one gene heterozygous and the other absent).

Although four selections bred true for blackarm resistance, the change in grade levels at Shambat does not allow separation of plants homozygous for B_2 from plants homozygous for B_2B_3. This difficulty may be overcome by using two techniques employed by Dr. Last. The first of these involves inoculation of the midrib of the youngest fully expanded leaves with *X. malvacearum* inoculum; the second of rubbing the youngest fully expanded leaves with carborundum and inoculum. Both techniques make it possible to separate plants homozygous for B_2 from those homozygous for B_2B_3.

Individual plants in the four homozygous selections (three straight F_5's and one F_4 first backcross) were selfed.

Analysis of the yield at Medani showed that in terms of yield, expressed as lb. lint per acre, the homozygous resistant selections significantly outyielded ($P = 0{\cdot}01$) both BAR 14/25 and Tanguis. Lint yield was analysed as a balanced incomplete block and a randomized block design. Analysis by the former method was 16% more efficient than the latter.

To obtain an index expressive of earliness, the first three picks were kept separate and yield of lint from the first three picks was divided by total lint yield. Data provided by this means were analysed as a randomized block. None of the strains was as early as the BAR 14/25 control, although they were all significantly earlier ($P = 0{\cdot}01$) than Tanguis.

For both ginning outturn and boll weight, none of the strains was as good as the Tanguis control. Nevertheless a great deal of variability was noted in each strain and it may still be possible to retain high yield and improve other desirable characters. In general, lint length and standard fibre weight were far removed from the Peruvian standard, with a strong bias towards BAR 14/25.

Relevant data for the four strains homozygous for blackarm resistance genes are given.

	Lint (lb./acre)	*Boll weight (grams)*	*G.O.T.*	*"Earliness" (A/A+B)*
Strain T5/58	718	2·72	32·6	0·651
,, T7/58	578	2·88	33·9	0·645
,, T15/58	544	2·72	32·0	0·683
,, T24/58	588	2·89	30·9	0·727
Tanguis (C)	463	3·04	36·6	0·485
BAR 14/25 (C)	403	2·50	29·2	0·802
Mean	536	2·84	32·1	0·700
S.E. (mean)	21·6			0·022
L.S.D. (1%)	80·6			0·082

'A' = Lint from first three picks. 'A + B' = Total lint.

(2) (BAR 14/25 × Tanguis) F_3 × BAR 4/16.

During the 1956-57 season selections from (BAR 14/25 × Tanguis) F_3 were crossed with BAR 4/16. Selfed seed from single plants of the F_1 of this cross was planted at Shambat to test for blackarm resistance. The progeny of ten of these single plant selections graded 7-8 and under. Again, using the normal spraying technique employed at Shambat, it was not possible to distinguish between plants homozygous for B_2 and those homozygous for B_2B_3.

(3) (BAR 14/25 × Tanguis) F_3 × BAR 4/25.

In order to introduce the gene B_6, a selection from (BAR 14/25 × Tanguis) F_3 was crossed with BAR 4/25 (an L type homozygous for $B_2B_3B_6$). Plants grown from selfed seed of single plant selections from the F_1 of this cross were tested for blackarm resistance at Shambat. Plants which graded 3 and under were individually selfed, and selfed seed from these will be used to substantiate whether or not the plants grading 3 and under actually are homozygous for $B_2B_3B_6$.

General.

In view of the fact that B_2B_3 resistance has, under standard conditions of spraying, slipped to that of B_2 and that the material on hand tends towards the BAR 14/25 parent, it appears desirable that a $B_2B_3B_6$ or a B_2B_6 Tanguis should be produced as soon as possible. A programme of successive backcrossing and selfing-out could then be adopted until the desired end-point is reached. Under field conditions the blackarm status of the segregates could be determined with ease and micronaire readings could give trends towards fibre coarseness.

Alternatively, large F_2's from the cross Tanguis ($B_2B_3B_6$) × Sakel ($B_2B_3B_6$) could be grown and an intensive search made for the desirable combinations. It should be noted that the anomalous behaviour of B_2B_3 resistance did not appear until the 1956-57 season, when this work was well under way.

Grade (R. C. Faulkner & J. E. Jackson).*

Nucleus Renewal Programme.

Progenies of single plants taken from a bulk of XL1 were planted in three 11 × 11 lattice squares. Selection was carried out for high yield and early cropping, the best progenies being retained for sowing next season in a panmictic bulk.

*The full report of which this is a summary will be found in the 1958-59 Annual Report of the Research Division, Ministry of Agriculture, Sudan Government.

Investigations on Cotton Grades.

An analysis of plant development data, from the Gezira observation plots, was initiated to elucidate the effects of season, nitrogen and spacing treatments on plant growth, and to correlate these with seasonal and treatment variations in seed cotton grades.

Between 1939 and the commencement of spraying, there was a trend towards later development of the fruiting structure, flower buds and bolls, in both S and L cottons, which delayed maturity by about 10 days. In the years after spraying was started, this trend was no longer apparent, and there have been considerable seasonal fluctuations in the rate of crop development.

A study of the effects of nitrogen and spacing in all years since 1939 showed that, in the pre-spraying years, close spacing resulted in an appreciably earlier crop than wide spacing at all sites, whereas in the spraying years, at some sites, this difference no longer occurred.

The main result of 3N application was to increase the amount of late crop whilst only slightly reducing the early crop.

Seed cotton grades were recorded on the Gezira observation plots since 1950-51 (i.e. only since the commencement of spraying). Seasonal fluctuations in average grade were very large, being similar for all treatments, and were not related to fluctuations in crop earliness. Within a season the most marked treatment effect was the depression of average grade by nitrogen. This was almost entirely due to an increase in the amount of the poorer grade late picks.

Analysis of grade data from experiments carried out this season by the Agronomy Section showed that N and P applied together gave a considerable increase in the yield of good grade cotton, though neither of these had such an effect when applied alone.

SHAMBAT STATION

BY

S. O. S. DARK AND J. H. SAUNDERS.

Meteorology.

Rain was very light this season, the total being 4·8 ins. The winter was long and cool. The mean maximum temperature was lowest in February (84° F.) rising to 104° F. in April. Luxuriant plant growth was obtained this season but the out-of-season plants were rather dwarfed.

Blackarm.

The blackarm situation becomes more complicated. A large replicated and randomized experiment was laid down in-season, containing 28 blackarm resistance factor combinations. This was sprayed with 3 strengths of spray derived from inoculum obtained from Medani and from Shambat. In each case inoculum was made up from infected trash and also from pure culture of *Xanthomonas malvacearum* grown on agar. The results of grading the leaf lesions on a Sakel background were as follows.

1. The Shambat inoculum was as virulent as in last year's experiment, but that from Medani was, in general, equally virulent.

2. Inoculum prepared from plant trash, in the standard manner, was approximately 2 grades more virulent than that prepared from agar cultures, both sprays containing equal concentrations of bacteria.

3. The only factor to show a differential effect between Shambat and Medani inoculum was B_3, the grade of the Medani attack being in this case similar to that found for all varieties in previous seasons, that is two grades less virulent than that from Shambat.

4. The resistance of B_2B_6 and $B_2B_3B_6$ remains as great as in previous years.

5. The mean blackarm grade of B_1, B_7 and B_2B_6 this season was 1-2 grades less virulent than the values published in the literature. The mean grade of B_2, B_3, and B_2B_3 was 1-3 grades more virulent than the published values.

The systemic phase of the disease was seen in a limited zone on plants of BAR 14/25. It appeared to correspond to the height which was the apex of the plant at the time of spraying with inoculum.

Evidence is accumulating to indicate that B_3 is not a unit character.

The techniques of needleprick inoculation in the leaf vein, and rubbing the leaf surface with a mixture of inoculum and carborundum powder, were tried out this season in the field and in the glasshouse. Some promising results were obtained but a lot of work must still be done to develop the methods and the interpretation of their results.

A test for boll resistance to *X. malvacearum* showed that B_2, B_3, B_2B_3, B_5 and B_7 gave no protection against this phase of the disease. However, B_2B_6, $B_2B_3B_6$, B_4 and B_9 were all equally very resistant.

Genetics.

The call in the Sudan for diversification of the types of cotton to be grown has produced a different emphasis in the breeding work.

Transference of B_2B_6 Blackarm Resistance.

It has now been decided that in new transferences it is more advantageous to use B_2B_6 than $B_2B_3B_6$.

This transference to Ashmouni 34, BAR 11/7, Acala 4.42 and Pima S1 is being pushed as fast as possible.

Production of Egyptian Varieties Resistant to Blackarm.

BAR 14/50, which is a further strain of Sakel carrying $B_2B_3B_6$ (8th backcross to Sakel and 4th backcross to BAR 14/25), has been sent to Medani for trial against BAR 14/51, the B_2B_3 strain segregated from the same backcross. The object is to determine whether B_6 has any discernible effects besides blackarm resistance.

The homozygous $B_2B_3B_6$ families derived from BAR 4/25H have been sent to Medani for further work.

The synthesis of new combinations in pairs of the B factors is proceeding. In the heterozygous state, the combination B_2B_4, either with or without B_6, is the only one to give enhanced resistance as judged by leaf lesion grading.

A series of families derived from Tanguis was analysed to determine their B_2B_3 blackarm resistance status, and the homozygous resistant ones were returned to Medani for further breeding work.

Strains of standard varieties of composition b_2B_6 are being synthesized, and the transference of B_1, B_5 and B_7 to *hirsutum* stocks, for use in homology tests, is proceeding.

The investigation of blackarm resistance factors transferred from *herbaceum* to Sakel continues.

Jassid Resistance.

The production of hairy Sakels as a means of achieving jassid resistance has for many years past formed an important part of the work of this section. However, owing mainly to the unfavourable increase of whitefly in the presence of dense hair of moderate length the Scientific Advisory Committee for Agriculture for the Sudan decided that the amount of time devoted to this part of the breeding work should be severely curtailed. Two J lines selected only for hairiness were bulked in 1957-58 to provide seed for a large scale examination of hairy plants and their yield potential. In order to keep the environment as even as possible from the pest point of view, these two strains were sown alone in randomised blocks on three different sites in plots of 0·258 acres. For this reason no direct statistical comparison can be made with the glabrescent Sakels. However, rough comparisons can be made with yields from adjacent variety trials.

Only one comparison of the two J's showed a significant difference, and that was at Turabi, where the L.S.D. (5% level) was 10·66 lb. lint per acre. The interest in the yield figures lies in the fact that gradient for increase is south to north, the reverse of that for Sakel strains. It would appear from the figures also that these two strains are as good as the Sakel commercial types for yield. However, they were very disappointing for quality, the graders giving them a uniform 7-8, this being due largely to their short staple. This lack of quality in these hairy strains may well prove an insuperable objection to their

Location	*Strain*	*Jassid infestation*	*Seed cotton lb. p.a.*	*Lint lb. p.a.*	*G.O.T.*
Turabi	J1689/57	Heavy	1805	557	30·9
	J1690/57	,,	1756	537	30·6
	S.E. (mean)			2·7	
Adjacent V.T.	DS	,,	1432	428	29·9
	BAR 14/25	,,	1321	394	29·8
G.R.S.	J1689/57	Moderate	1400	405	28·9
	J1690/57	,,	1346	388	28·8
	S.E. (mean)			9·3	
Adjacent V.T.	DS	,,	1459	426	29·2
	BAR 14/25	,,	1346	379	28·2
Hag Abdalla	J1689/57	Nil	1612	474	29·4
	J1690/57	,,	1691	489	28·9
	S.E. (mean)			5·5	
Adjacent V.T.	DS	,,	1925	552	28·7
	BAR 14/25	,,	1548	419	27·1

Plots 0·258 acre. Randomised blocks. 5 reps. per site.

continuation. Basic studies on the genetics of hairiness continue and a paper dealing with the mechanism of hairiness in *G. hirsutum* has been prepared for publication.

Yield.

Two small scale variety trials to test lines with increased ovules per locule were grown at Wad Medani.

Trial A: Plot size 0·0112 acre, 8 reps. in randomised blocks

BAN Families 1956-57	*Mean yields per acre in lb.* Seed cotton	Lint	G.O.T.
1	1095	328	30·0
4	1134	336	29·6
6	1085	301	23·5
7	1078	332	30·8
BAR 14/25	1134	332	29·3
S.E. (mean)		10·69 (N.S.)	
C. of V. 3·4%			

In two previous years' tests these BAN strains showed promise of increases of yield over BAR 14/25. It is not apparent in this year's results.

Trial B included the same four strains (BAN 1, 4, 6 and 7/56) that were tested in A, the difference being that the seed in A was natural seed harvested at Wad Medani from the previous year's sowing (outcrossing is thought not to exceed 2%) whereas the seed in B was self-bred at Shambat. These results do not reveal any worthwhile yield increases in the BAN material but 70 progenies of single plant selections from the same families were grown at the same time. They were assessed for desirable features and 17 lines showed good promise

Trial B: Plot size 0·0112 acre, 4 reps. in randomised blocks.

BAN Families 1958-59	*Mean yields per acre in lb.* Seed cotton	Lint	G.O.T.
1 (BAN 1/56)	1254	380	30·3
2 (,, 4/56)	1157	360	31·1
3 (,, 6/56)	1124	345	30·7
4 (,, 7/56)	1077	351	32·6
5	1011	314	31·1
8	1135	363	32·0
9	1093	350	32·0
10	1126	349	31·0
BAR 14/25.4	1117	334	29·9
BAR 14/25	953	288	30·2
S.E. (mean)		24·27 (N.S.)	
C. of V. 7·2%			

of future usefulness. The characters of chief interest were lint colour, ginning outturn, lint index, seed number and lint per plant. It would appear that, although the mean values of the BAN lines do not exceed those of the standard Sakel types, the range of values, i.e. the variability, is greater, thus promising profit from selection. In particular the feature "white lint" has emerged alongside the search for increase in yield. This may well prove to be of equal importance, since there is at present a buyers' prejudice against the cream colour of BAR 14/25 lint.

The 17 selected progenies will be tested in a variety trial at Wad Medani in the coming season and parallel to this they will be multiplied at Shambat. Selection will continue with particular attention to obtaining a tufted, nearly naked seed as opposed to fuzzy.

At Shambat other high ovule lines were examined. Only one family, N8/58, was of particular interest. A summary of the characteristics of 98 single plant selections is given here.

N8/58
Ovules per locule classes
(5 flowers per plant)

	7·5/7·9	8·0/8·4	8·5/8·9	9·0/9·4	9·5/9·9	Mean
Number of plants	10	12	42	26	8	8·9

BAR 14/25 average of 40 plants was 6·3 ovules per locule.

Lint length classes in mms.
(5 seeds/plant sample)

	43	44	45	46	47	48	49	50	Mean
Number of plants	—	4	28	161	264	33	—	—	46·6
BAR 14/25	—	—	—	3	7	14	1	—	47·5

Of these 98 plants, 47 were selected for multiplication. These combined lint length as good as or better than 46·5 mms. with ovules per locule of 8·5 or better. The lint from the parent plants was sent to the Shirley Institute for stelometer tests. The results are summarised

as follows, the control readings being 28·8 (BAR 14/25.5) and 30·5 (BAR 14/25).

	Classes grouped in grammes/tex units.				
Range of 47 selections	26·0/26·9	27·0/27·9	28·0/28·9	29·0/29·9	30·0/30·9
	1	7	15	20	4

High ovule number strain synthesis was initiated with the object of increasing yield. It seems possible from this first year of detailed examination of single plants that selection may develop other desirable features, not least being lint colour and G.O.T.

In the transference of the increased boll-loc number from *hirsutum* to *barbadense* the presence of a major gene controlling the multigene system has not yet been demonstrated. Further families have been bred whose scoring should determine whether such a gene is present or whether the character is entirely controlled by polygenes.

Exploitation of Wild Species and Asiatic Cottons.

Studies on interspecific hybrids between *G. anomalum* and *G. triphyllum* continue.

Work on the transference of the closed boll of Wagad 8 (*G herbaceum*) to a tetraploid commercial cotton is progressing. If this is successful, a new type of cotton for mechanical picking may result.

Further work attempting the transference of *G. anomalum* blackarm resistance has begun.

A new species, *G. incanum,* from the Aden Protectorate has been cultivated at Shambat and successfully hybridised with *G. somalense, G. areysianum* and *G. stocksii.* It is thus almost certainly a member of the E genome, in which it is placed on morphological grounds.

Notoxylinon australe has been successfully hybridised with *G. sturtii.*

High Lint Strength Transference from G. thurberi.

The course of this transference has been written up for publication. The work has been discontinued because the character depends upon a multigene system and at present there is no practical method of maintaining it in a commercial variety. This season two lines were obtained of strength equal to the best of those derived through the transference, by straight selection from the control variety BLR 14/16.

Bollworm Resistance.

The results were very inconclusive this season because of the small number of bolls produced by the plants of the in-season crop, while the out-of-season experiment was only very lightly attacked by bollworms. The most promising plants were selected for further self breeding and also backcrossing to BAR 11/7.

Leafcurl.

The attack of leafcurl was light this year and caused very little damage.

The bulk backcrossing experiment to BAR 14/25 was continued for Medani.

KADUGLI STATION

BY

M. F. ROSE, A. LOW AND HAMDAN EFF. HANNAY.

The Commercial Crop.

Estimates of area for the Nuba Mountains rainfed crop are given as 192,000 feddans, an increase of 21% over that of the previous season: 574,025 small kantars were purchased averaging 2·99 small kantars per feddan, a figure somewhat below the general expectation. If records from the standard variety trial sites can be taken as a reflection of general conditions, rainfall was below average except at Dilling and Lagowa: on the whole its distribution was more favourable to the crop than that of the previous season, when abnormally early rains were noted in various areas.

Nuba Mountains 1958-59 season.

Rainfall mm.

Station	*April*	*May*	*June*	*July*	*Aug.*	*Sept.*	*Oct.*	*Total mm.*
Kadugli	46·0	41·0	184·0	157·5	79·5	139·0	24·5	671·5
Talodi	50·5	79·5	147·5	219·5	131·5	76·5	75·5	780·5
Abu Gubeiha	36·0	33·0	104·0	189·0	86·0	97·0	67·0	612·0
Dilling	—	12·0	113·0	226·0	189·0	164·0	42·0	746·0
Lagowa	37·5	22·0	173·5	206·5	215·0	107·0	14·5	776·0

Observational data from the scattered variety trials indicated a low incidence of pests and disease, with the exception of pink bollworm: attack from this pest was generally severe, especially in the Eastern Jebels. Blackarm was present throughout the crop although its intensity of attack was very light. *Ramularia* was again conspicuous at Talodi with an apparent increase in the Kadugli area. Flea beetle damage to seedling cotton was very light although the pest caused considerable defoliation on the mature crop in October and November. Infestation by stainer bug was negligible, with leaf roller (*Sylepta derogata*) virtually absent from the commercial crop.

Variety Testing.

(1) Kordofan.

Germination and establishment of the five standard trials in the Jebels area was satisfactory, and at Kadugli and Talodi fairly good yields were obtained. At Dilling, Lagowa and Abu Gubeiha yields were down to the level of the commercial crop; a fact ascribed to severe pink bollworm attack at Abu Gubeiha and progressive soil deterioration to a very low level on all three demonstration farms. Comprehensive data are given in Table 3.

Considering the trials at Kadugli and Talodi, it will be noted that Punjab 268F has outyielded significantly all other varieties with the exception of BAR SP84 at Talodi: in terms of overall (lint) return it also heads the list. However, these yields are not spectacular when referred to those obtained under irrigation in the Central Gezira, where mean yields of 2,800 lb. of seed cotton have been obtained from propagation areas of 35 acres. In trials at Tozi and Yambio during the current season Punjab 268F also gave below-average returns, and since the trade shows little interest in its lint type, this variety will be dropped from all rainland trials after the 1959-60 season.

BAR 7/8.2 (replacing BAR 7/8.1 in all trials) has done well at Kadugli although its relative position in the Talodi trial is somewhat disappointing.

With lint returns only average, Wilds Sus 16/1 has not maintained its position of superiority of the past two seasons. However, two facts emerge from the three years of testing: (1) that this long staple American irrigated cotton can compete successfully with the standard rainfed types, (2) that it can be saw-ginned without marked deleterious effects on lint quality.

The Pump Scheme Strain—BAR 11/7 comparisons are worthy of note and indicate that yield improvement within BAR 11/7 has been achieved. Thus at Kadugli, BAR 11/7 Group I has significantly outyielded (lint) Pump Scheme while at Talodi a 12% increase in favour of BAR 11/7 Group I just fails to reach significance: the general pattern of overall mean values (lint) is also encouraging. However, the gap between the lint yields of the BAR 7/8 series and those of BAR 11/7 still remains wide and will have to be narrowed. To this end work is under way at Wad Medani (see "American Breeding"), and a measure of success has already been achieved in the transfer of boll size from Wilds Sus 16/1 to BAR 11/7, at the same time retaining the desirable lint characteristics of the latter.

At Dilling and Lagowa a yield pattern roughly similar to that of Kadugli and Talodi emerges: at Abu Gubeiha where yields were seriously affected by severe pink bollworm attack there is nothing in the Pump Scheme—BAR 11/7 comparison. Here BAR 7/8.2 has given

TABLE 3.

VARIETY TRIALS. NUBA MOUNTAINS, 1958-59.

Yield of seed cotton and lint in lb./acre.

Variety	*Dilling*		*Kadugli*		*Talodi*		*Lagowa*		*Abu Gubeiha*		*Overall Means*		
	S/c.	*Lint*	*S/c.*	*Lint*	*S/c.*	*Lint*	*S/c.*	*Lint*	*S/c.*	*Lint*	*S/c.*	*Lint*	*G.O.T.*
BAR 7/8.2	481	154	1099	369	766	263	511	168	377	121	647	215	33·2
BAR SP84	380	121	869	289	808	271	354	113	265	86	535	176	32·9
Wilds Sus 16/1	525	150	986	302	813	258	398	115	365	107	617	186	30·2
Punjab 268F	448	142	1204	398	810	296	467	140	351	111	656	217	33·1
BAR 11/7	411	122	988	299	726	215	434	127	221	66	557	166	29·8
BAR 11/7.1 Group 1	382	117	1033	318	841	252	404	120	208	61	574	174	30·3
BAR 11/7.1 Group 2	382	116	1001	308	785	236	437	128	207	63	562	170	30·2
PSS	344	108	959	281	769	225	371	106	263	74	541	159	29·3
S.E. (mean)		7·0		10·0		10·6		5·2		4·7			
L.S.D. (5% level)		20·1		28·5		30·4		14·9		13·5			
Planting date	13th July		13th July		2nd July		8th July		7th July				
Picking date	19th Nov.-8th Dec.		10th Nov.-20th Dec.		8th Nov.-22nd Dec.		14th Nov.-10th Dec.		1st Nov.-20th Dec.				
Layout	8 × 8 Latin square		8 × 8 Latin square		8 × 8 Latin square		8 × 8 Latin square		8 × 8 Latin square				
Effective plot size	0·027 acre		0·027 acre		0·027 acre		0·027 acre		0·027 acre				
Spacing	90 × 45 cms. 3 p.p.h.		90 × 45 cms. 3 p.p.h.		90 × 45 cms. 3 p.p.h.		90 × 45 cms. 3 p.p.h.		90 × 45 cms. 3 p.p.h.				

the highest yield (lint), significantly outyielding all varieties except Punjab 268F.

Blackarm and *Ramularia* counts were made at all variety trial sites in early November. From the figures given below it will be seen that blackarm attack was negligible and could have had little effect on yield. Dilling showed the highest intensity and frequency of attack but Pump Scheme Strain, the most susceptible of all varieties grown, has shown a mean grade as low as 3·8. The above-average rainfall at Dilling may well have accentuated general incidence.

Regarding *Ramularia*: the Talodi infection figures are again high with an apparent breakdown in the resistance of Wilds Sus 16/1 at this site only. A similar anomaly was recorded in last season's counts and discussed in the Kadugli Report for 1957-58. The general pattern of infection follows roughly that of the previous season although the figures from Kadugli stand at a higher level.

(*2*) *Tozi* (*Central Rainlands*) *and Yambio* (*Equatoria Province*).

One variety trial was conducted at Tozi and two in Equatoria during the current season. These were under the direct control of the respective Senior Research Officers and acknowledgement is made to them for plot data kindly supplied to this Cotton Breeding Section. The results of the three trials are embodied in Table 4.

TABLE 4.
VARIETY TRIALS, 1958-59. TOZI AND YAMBIO.
Yield of seed cotton and lint in lb./acre.

	Tozi			*Yambio Road A*			*Yambio Road C*		
Variety	*S/c.*	*Lint*	*G.O.T.*	*S/c.*	*Lint*	*G.O.T.*	*S/c.*	*Lint*	*G.O.T.*
BAR 7/8.2	623	216	34·7	1238	485	39·2	1178	467	39·6
BAR SP84	544	182	33·4	780	306	39·2	727	278	38·3
Wilds Sus 16/1	775	242	31·2	1068	401	37·5	1239	458	37·0
Punjab 268F	402	132	32·7	701	264	37·7	750	279	37·2
BAR 11/7	319	97	30·5	1069	364	34·0	1158	409	35·3
BAR 11/7.1 Group 1	372	117	31·5	1127	388	34·4	1031	365	35·4
BAR 11/7.1 Group 2	318	97	30·6	1056	377	35·7	1230	435	35·4
PSS	400	115	28·7	816	277	34·0	777	267	34·3
S.E. (mean)		15·7			21·1			18·5	
L.S.D. (5%)		45			60			53	
Planted	5th July			6th June			6th June		
Picked	9/11-20/12			From early Oct.			From early Oct.		
Layout	Randomized block (6)			Randomized block (6)			Randomized block (6)		
Effective plot size (acre)	0·011			0·026			0·025		
Spacing	28" × 6". 1 p.p.h.			90 × 45 cms. 3 p.p.h.			90 × 45 cms. 3 p.p.h.		

Reports from Tozi indicate that germination and early growth were excellent. However, a heavy Sudan bollworm attack in September must have reduced yields considerably: blackarm was noted on all

BLACKARM AND *Ramularia* INCIDENCE.

Nuba Mountains variety trials, 1958-59

Variety	*Blackarm*									
	Kadugli		*Lagowa*		*Abu Gubeiha*		*Talodi*		*Dilling*	
	G.	%	*G.*	%	*G.*	%	*G.*	%	*G.*	%
BAR 11/7	0·2	5·0	0·01	0·1	0·3	4·0	0·2	4·0	0·8	27·0
BAR 11/7.1 Group 1	1·2	29·0	0·01	0·2	0·4	5·0	0·2	5·0	1·4	35·0
BAR 11/7.1 Group 2	1·1	22·0	0·01	0·4	0·3	5·0	0·3	4·0	1·2	35·0
BAR 7/8.2	0·1	4·0	0·0	0·0	0·1	1·0	0·1	5·0	0·5	19·0
BAR SP84	1·4	33·0	0·1	2·0	0·6	10·0	0·2	5·0	3·0	57·0
PSS	1·5	35·0	0·3	4·0	0·3	5·0	0·2	5·0	3·8	64·0
Punjab 268F	0·3	11·0	0·01	0·2	0·2	2·0	0·2	5·0	0·9	28·0
Wilds Sus 16/1	0·0	2·0	0·0	0·0	0·01	1·0	0·1	4·0	0·9	30·0

Variety	*Ramularia*			
	Kadugli %	*Dilling* %	*Talodi* %	*Abu Gubeiha* %
BAR 11/7	65·0	6·0	59·0	7·0
BAR 11/7.1 Group 1	26·0	20·0	63·0	13·0
BAR 11/7.1 Group 2	20·0	3·0	53·0	9·0
BAR 7/8.2	100·0	12·0	60·0	3·0
BAR SP84	11·0	8·0	59·0	21·0
PSS	22·0	20·0	63·0	13·0
Punjab 268F	11·0	8·0	57·0	11·0
Wild Sus 16/1	1·0	1·0	63·0	4·0

G. = Grade = Mean intensity of attack. % = Mean frequency of attack.

varieties but it was never serious and could have had little effect on yield. At Yambio where good yields were obtained from both trials the season was reported as favourable. There was good germination and establishment with no unusual infestation of pests or disease.

Lint returns from the Tozi trial were below those of the previous season and considerably less than the Kadugli and Talodi yields. Wilds Sus 16/1 significantly outyielded all varieties except BAR 7/8.2, with Punjab 268F ranking fourth on the list: there was nothing to choose in the Pump Scheme—BAR 11/7 comparisons.

At Yambio both trials were above average, with the yield pattern roughly similar at both sites. The yields of BAR 7/8.2 were again high, followed closely at the C site by Wilds Sus 16/1: Punjab 268F yielded poorly. The most encouraging feature of both trials is the relative position of Pump Scheme Strain and the BAR 11/7 derivatives: at the A and C sites the latter outyielded the control Pump Scheme Strain by 38% and 50% lint respectively.

For the fifth consecutive year, very high ginning outturns were recorded from the Equatoria trials.

Intra-BAR 7/8 Series: General Survey.

In view of the fact that the commercial crop, BAR 7/8.1, will be replaced shortly by the quality type BAR 11/7 or its derivatives in the Nuba Mountains*, it was deemed advisable to take stock of the position of the five filters on hand from BAR 7/8. To this end the intra-BAR 7/8 trial was planted on 14th July prior to the shelving of this breeding material.

BAR 7/8, produced at Shambat in 1948 and propagated for the first time as a mixed bulk in the Gannaya area in 1949-50, fell somewhat below the commercial requirement. The first consideration was one of purification and standardization. BAR 7/8.1, the first filter, achieved a marked improvement in quality, and trials indicated a yield superiority over its commercial predecessor BAR SP84. The second filter, BAR 7/8.2 (from BAR 7/8.1) aimed at a further yield advance with further attempts to peg the quality level to that of BAR SP84. Significant differences in yield over BAR 7/8.1 were given by trials throughout the Sudan, but neppiness, seed coat nep and intrinsic fibre weakness were still apparent. Ignoring yield and specializing in the removal of two of the major defects, a further filter was made, 3035/3041, which for the purpose of this trial was resuscitated as BAR 7/8.5. Here again lint quality showed no improvement. While this work was in progress results from Namulonge indicated that seed coat nep could be considerably reduced at the gin and a similar procedure

*A restricted area of BAR 7/8.2 will still be grown in the South-western Jebels.

was adopted here giving rise to the filters BAR 7/8.3 and 4. The tabulated figures indicate that progressive improvement can be achieved by the simple expedient of discarding at the gin (roller) single plants transcending an abitrary value of seed coat nep: seed retained is bulked and the process repeated the following year.

To sum up: BAR 7/8.2 has given consistently high yields throughout the Sudan and there is no reason to suppose that still higher yields could not be attained within it: seed coat nep could most certainly be reduced to a reasonable level but there are strong indications that neppiness and intrinsic fibre weakness are inherent in the variety with little chance of improvement by straightforward selection. The answer to this latter problem will doubtless be found in the infusion of fresh blood from quality types (see "American Breeding").

INTRA-BAR 7/8 TRIAL.

Kamina farm 1958-59

Variety filter	*S/c. lb./acre*	*Lint lb./acre*	*G.O.T.*	*Seed coat nep %*
BAR 7/8.1	1276	426	33·4	25·5
BAR 7/8.2	1392	476	34·2	—
BAR 7/8.3	1342	448	33·4	23·0
BAR 7/8.4	1365	449	32·9	21·2
BAR 7/8.5	1352	449	33·2	—
S.E. (mean)		10·9		0·97
L.S.D. (5%)		N.S.		2·9

Planted 14.7.1958. Picked 11.11.58-21.12.1958.
Randomized block: 10 replications: effective plot size 0·014 acre.

COMMERCIAL PROPAGATION.

With a trade swing towards a better quality nep-free cotton, it was deemed advisable to plant the whole of the Abu Habl Scheme and Semeiha Extension to BAR 11/7. In the absence of adequate propagation areas in which seed from successive waves could be utilized to maximum capacity, the accumulation of seed of this variety from small isolated plots has been slow. However, after 5 years, sufficient seed became available to plant 4,800 feddans. Germination and establishment (under the 'ponding system') were satisfactory but the crop suffered severe thrips attack which must have affected final yields. The area averaged 2.62 small kantars of seed cotton per feddan with seed sufficient to plant 100,000 fedans at Lagowa, 4,800 at the Abu Habl, and 12,500 on the East Bank (Equatoria) in the 1959-60 season. This second wave seed from Lagowa should meet all possible requirements for the rainfed areas in 1960-61, with BAR 11/7 displacing all other varieties on the East Bank in the same year. As far as is known, the status of BAR 7/8.1 on the West Bank (Equatoria) will remain unchanged.

To maintain type, 2 feddans of Pump Scheme Strain were grown in isolation at El Effein.

Publications.

Saunders, J. H.—'The Wild Species of *Gossypium*'. Part I. Empire Cotton Growing Review, Vol. 36, No. 1, January 1959.

Appendix.

Key to Symbols Used in this Report.

Egyptian S types.	
DS	Domains Sakel originally imported from Egypt.
BAR 14/25	A Sakel type carrying B_2 and B_3 (formerly BLR).
BAR 14/25.4 and 5	4th and 5th filter for yield (formerly BLR).
BAR 14/48	The first Sakel type to carry $B_2B_3B_6$ (formerly BLR).
BAR 14/49	Successor type to BAR 14/48.
BAR 14/50	Successor type to BAR 14/49.
BAR 14/51	The B_2B_3 equivalent of BAR 14/50.
BLR 14/16	From the Sakel type BAR 14/7 (B_2) reselected for its leafcurl resistance.
Egyptian L types.	
X1730A or XA	Successor type to X1730.
BAR XL1 BAR 1730 L1	1st filter of BAR 1730L carrying B_2.
BAR 4/16	An X1730A type carrying B_2 and B_3.
BAR 5/6	As BAR 4/16 but carrying the red *arboreum* gene R_2^{RS}.
BAR 4/23	X1730A carrying B_2 and B_3.
BAR 4/24	An X1730A type carrying $B_2B_3B_6$.
BAR 4/25	An X1730A type carrying $B_2B_3B_6$.
BAR 5/7	As BAR 4/25 but carrying in addition the red *arboreum* gene R_2^{RS}.
BAJ lines	The hairy Sakel series, homozygous for B_2 and B_3 and carrying H_1.
BAN lines	A Sakel series stemming from the cross BAR 14/25 × *G. auritum*: ovule transfer for yield increase.
American Upland.	
BAR SP84	The blackarm resistant component of Uganda SP84.
BAR 7/8.1 BAR 7/8.2	BAR SP84 carrying B_2 and B_3, 1st and 2nd filters.
Pump Scheme Strain (PSS)	An old commercial bulk derived from Nyasaland Upland.
BAR 11/5	XA129 (PSS) carrying B_2.
BAR 11/7	XA129 carrying B_2 and B_3.
BAR 11/9	XA129 carrying B_2, B_3 and B_6.
BAR 11/7.1	1st filter of BAR 11/7.
Wilds SUS 16/1	American long staple type: irrigated.
P268F	American importation direct from India.
Hopi Acala	A very early type directly imported from U.S.A. in 1953: of high intrinsic fibre strength.
Acala 4.42	A high quality American importation, 1955.

Genes.

B_1	A weak dominant blackarm resistance factor from Uganda B31.
B_2	A strong dominant blackarm resistance factor from B31.
B_3	A partially dominant blackarm resistance factor from *G. punctatum*.
B_4	A partially dominant blackarm resistance factor from *G. arboreum*.
B_5	A partially dominant blackarm resistance gene from Grenadines White Pollen.
B_6	A blackarm resistance intensifier from *G. arboreum*.
B_7	A partially dominant blackarm resistance gene from Stoneville 20.
b_8	A recessive blackarm resistance gene from *G. anomalum*.
H_1	A hairiness gene from Tanguis.
H_2	A hairiness gene from *G. tomentosum*.

Sudan Measures and Weights.

1 feddan = 1·038 acres.
1 large kantar = 315 rotls.
1 small kantar = 100 rotls.
1 rotl = 0·99 lb.

Received August 1959.

PROGRESS REPORTS FROM EXPERIMENT STATIONS.

The reports for the seasons up to and including 1950-51 were published in seasonal volumes; the following are still in print and available at 3/- per volume post free.

1923-25 (one volume), 1926-27, 1931-32, 1934-35, 1935-36, 1942-43 and 1945-46 to 1950-51.

From 1951-52 the reports from each territory were published individually each season. A few of the 1951-52 reports are out of print, but all others are available post free at 1/- per report or 7/6d. for the seasonal set.